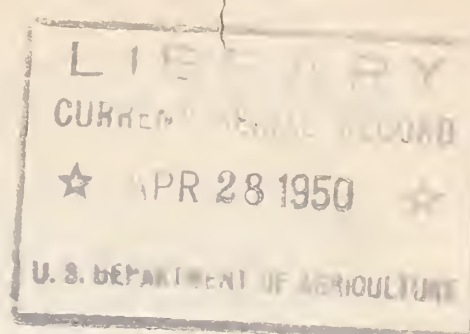


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## WATER - THE LIFEBLOOD OF CIVILIZATION.

Water is the priceless resource on which all growing things depend. It is the lifeblood of civilization.

Where there are ample supplies of good water, vigorous nations can flourish. Farms thrive, cities prosper. When the supply of water fails farms are abandoned, communities are imperiled, and cities and cultures die, leaving crumbling ruins to mark their past glory.

The city dweller of the humid East, accustomed to unstinted quantities of water for drinking and cooking, bathing and washing, and sprinkling lawns and gardens, encounters few of the difficulties that beset the inhabitants of western plains and semidesert communities. Yet even he is sometimes brought face to face with local water shortages, resulting from low supplies in reservoirs or in streams that feed his water mains. Year in and year out, the eastern farmer confidently expects enough rain to bring through his crops. Only during the most severe droughts does he worry about parched crops and seared pasture.

How different it is in the arid portions of the West. Here, where Nature is lavish with sunshine but niggardly with moisture, the struggle for existence is to a large extent a struggle for water. Here men once were killed in disputes over water rights. Throughout the Southwest, the farmer or rancher knows that until water can be brought to his land it is worthless for cultivated crops. Perhaps 20 to 30 unirrigated acres will feed a cow for a month or two during the year. Undeveloped, his land may be worth 50 cents per acre. Bring water to it, and its value jumps fifty-fold, a hundredfold, sometimes a thousandfold.

## SOMETIMES WE HAVE TOO MUCH WATER.

Newspapers often tell us of floods in some parts of the United States. Nearly every year, on the great central drainages, heavy rains and melting snow cause the waters to pour out of mountains and plains, to turn brooks into torrents, and to swell quiet streams into wild turbulent rivers. From Cairo to New Orleans, and from Pittsburgh to Paducah, the cry "River rising. River rising" is a familiar yet fearful refrain. . . . When the rivers sometimes become too high or too swift to be restrained, communities are inundated, families flee from their homes, croplands are washed out, and transportation comes to a halt. Hunger, disease, and death



stalk the raging waters.

Although given less publicity, the agricultural damage done by the many smaller, more frequent floods usually far exceeds the losses caused by the spectacular ones. In the Central States, ditches and drains cause the flows from spring rains and melting snow to run far more rapidly than in the days before white men settled on the land. Once, excess spring flood waters emptied into lakes and swampy lands, there to be detained for slow release into streams and rivers. Now, systematic drainage has virtually eliminated these natural reservoirs.

In the more rolling sections of the East, spring runoff was formerly absorbed and held temporarily in the porous soils beneath the unbroken expanses of forest. When large areas were converted to farm use, removal of the forest and practice of up-and-down hill plowing deprived the soils of much of their ability to catch --and store--water. The more steeply the land slopes, the more serious this is.

The effects of eliminating or seriously disturbing the natural forest cover are shown in the gullied farm lands and widened stream channels found in some densely settled areas. Partly because the stream channels are more or less filled with material washed down from the uplands, and partly because storm runoff has increased, the channels are today no longer able to carry all the flow from heavy precipitation. This explains why the streams over-top their banks far more often than in the days before settlement.

#### SOMETIMES WE HAVE TOO LITTLE WATER.

The same misuse of our land that helps to induce floods is also partly responsible for serious and costly shortages. When water from rain and snow is not stored in the soil but runs off quickly, there is no reserve to keep streams, lakes, and natural underground reservoirs supplied during the drier months of the year. Many of the 80 million Americans who depend on public water-supply systems and a considerable portion of those farmers in 17 Western States who look entirely to irrigation for their livelihood, have a vital interest in preventing water shortages.

Lack of water sometimes causes serious crop failures on irrigated farms. It has actually forced an exodus of people from some regions--for example, parts of the Great Plains where recurrent dust storms and depleted soils have made farming difficult. It has imperiled California's Central Valley, one of our great farming regions. It is generally believed, also, that underground supplies in the Mississippi and Ohio River Valleys, as well as in the Piedmont, are being drained faster than they are replenished. On many farms, wells go dry during summer heat and farmers have to fetch water long distances to keep thirsty cattle alive.

#### HOW SOIL, FORESTS, AND WATER ARE RELATED.

Forest land in addition to producing timber, forage, and wildlife, has enormous value as a regulator of water flow. Not only do forest soils retain moisture and store water; they also have much to do with controlling water movement both on and beneath the surface.

The forest floor is protected by the crowns of trees at different heights and the mass of shrubs and ground plants below. The surface itself is a mat of dead leaves, twigs, and other plant remains. Beneath this loose litter is



a layer of partly decayed vegetation, and below that, a mass of more or less completely rotted organic matter.

Underneath these organic layers is mineral soil, also occurring in layers. The top portion is considerably enriched with organic material and shot through with growing and decayed plant roots and the minute channels of innumerable earthworms, mites, insect larvae, bacteria, and fungi, working constantly throughout the soil. All this biologic activity keeps the soil porous and gives it a crumbly structure, ideal for holding, storing, and filtering large quantities of water.

Below these layers is the subsoil, sometimes derived directly from the weathering bedrock beneath. Except for the penetration of deep roots and the burrowing of insects and rodents, it contains few openings and is a much tighter structure, so that ordinarily the subsoil is incapable of detaining as much ground water as the topsoil.

Thus the speed and volume of water movement through the soil depend on its structure and the shape and continuity of the large pore spaces formed by plant roots and by animal and insect activity. Any given soil can store only a certain amount of rainfall. Hence the amount of water already in the soil determines how much will be stored during any particular storm--provided the water is able to get in. Good forest soils, which take water quickly, can hold 50 per cent or more of their total volume.

Snow accumulation and melt is also influenced by good forest cover. Protected against sun and wind, snow will remain on the forest floor from 1 to 5 weeks longer than on exposed areas. Also, more of the melting snow is absorbed by the loose, porous, and frequently unfrozen forest soil than the soil of open fields, which is commonly frozen.

When rain falls in the forest, part of it clings to the leaves or needles of trees and plants, where it later evaporates, and some trickles down the stems and plant stalks. In a hard or prolonged rain, a considerable amount of water falls directly on the forest floor, filtering into the topsoil and gradually filling its pores. For use in the life processes of the vegetation, some of this water is later pulled up into the stems and leaves before it is transpired into the air. If the ground cannot take in all the water that reaches it, some runs off over the surface.

Another part of the rain moves downward to become a part of the permanent water table that supplies our springs and streams. After the rain stops, slow drainage through the soil continues until only as much water is left as can be held there against the pull of gravity. This percolated, or ground, water is the major source of many streams.

#### FORESTRY TO CONSERVE ALL WATERSHED VALUES.

Sensible, well-balanced management of watershed forests recognizes the need for protection of soil and cover, increase of water taken into the soil, and reduction of evaporation losses, as well as continuous timber crops. It takes into account the fact that clear water, which furnishes moisture to the forested slopes is also needed by downstream communities.

Research and experience show us how to use protection forests for many purposes. We must know how they "operate"; determine the important uses they can safely withstand; and finally, put into actual daily



practice a program that balances the different acceptable uses. In many areas protection forests with proper management can serve forest industries, livestock operators, farmers, recreationists, cities, towns-- in fact, everybody. But in others, watershed values may be so high, and the danger of impairing the forest cover so great, as to require the strictest control over all woods activities. European countries have followed this policy in the Alps and elsewhere, and so has our Government in some areas within the National Forests.

Much more by way of improvement in management practices on our watershed forests can be accomplished than is generally realized. We are still a long way from doing the things we know can and should be done. And as more research is applied to our growing watershed problems, new or better methods of solving them will be discovered.

#### HOW WE CAN HELP SAFEGUARD THE NATION'S WATERSHEDS.

In a broad sense, all of us are responsible for maintaining our watersheds in good condition-- timberland owners, woods operators, farmers, ranchers; hunters and fishermen, berry pickers, tourists, hikers, campers; and even city folk who seldom set foot on wooded earth.

The health and economic security of nearly all Americans depend to a great extent on how well our forests are managed. Just as costly illness or a surgical operation may follow persistent neglect of the simple rules of personal hygiene, the abuse of watershed forests is apt to require expensive measures and perhaps decades of time to restore forest health which is so essential to the Nation. All classes of landowners and users must work together to help enforce the simple rules of "forest hygiene." For example, we must be extremely careful not to throw away burning material or allow camp or picnic fires to burn unattended.

Forest owners are usually the first to reap the fruits of good management. Because they have a serious public responsibility, these landowners must employ every means to prevent fire, eliminate improper cutting and log-skidding practices, and minimize grazing damage.

Urban water users and valley dwellers, though remote from the watershed forests, usually suffer the consequences of damaged uplands. These groups should demand, in particular, that landowners and users take the needful steps to prevent erosion and rapid runoff; otherwise, their general health and wellbeing may be imperiled. They also have responsibility for not wasting water, or using it without considering others' needs.

Because communities, farms, and industries suffer when the forests are mistreated, and the public treasury usually pays for the damage, each of us must share responsibility for safeguarding the Nation's precious watershed forests.

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(Extracted from "Water and Our Forests" - Misc. Pub. No. 600)